

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte BHARATH RANGARAJAN,
BHANWAR SINGH and RAMKUMAR SUBRAMANIAN

Appeal No. 2004-2336
Application 09/845,454

HEARD: January 26, 2005

Before GARRIS, WARREN and PAWLIKOWSKI, *Administrative Patent Judges*.

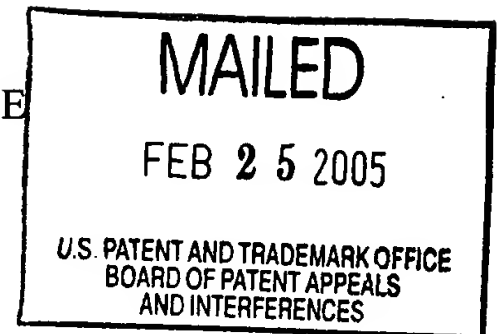
WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner finally rejecting claims 1 through 9 and 25. Claims 10 through 24 are also of record, of which claims 10 through 12 are objected to as being drawn to allowable subject matter but dependent on a rejected base claim, and claims 13 through 24 are withdrawn from consideration by the examiner under 37 CFR § 1.142(b).

Claims 1 and 25 illustrate appellants' invention of a system for monitoring and regulating an etch process and of a system for monitoring and regulating a trim process, respectively, and are representative of the claims on appeal:

1. A system for monitoring and regulating an etch process, comprising:



at least one etching component operative to etch at least one portion of a wafer;
an etch component driving system for driving the at least one etching component;
a system for directing a single beam of light onto one or more gratings located on at least one portion of the wafer;

an etch monitoring system operable to measure one or more etching parameters from light reflected from one or more gratings; and

a processor operatively coupled to the etch monitoring system and the etch component driving system, wherein the processor receives an etching parameter data from the measuring system and analyzes the etching parameter data by comparing the etching parameter data to stored etching data to generate a feed-forward control data operative to control the at least one etching component.

25. A system for monitoring and regulating an [sic] trim process, comprising:
means for partitioning a wafer into one or more grid blocks;
scatterometry means for sensing the acceptability of etch in at least one of the one or more grid blocks;
means for controlling the etching of a wafer portion; and
means for selectively controlling the etching means.

The references relied on by the examiner are:

Jahns	5,711,843	Jan. 27, 1998
Eriguchi et al. (Eriguchi)	6,113,733	Sep. 5, 2000
Ko et al. (Ko)	6,117,791	Sep. 12, 2000
Xu et al. (Xu)	6,483,580	Nov. 19, 2002 (filed Mar. 6, 1998)
Su	6,486,492	Nov. 26, 2002 (filed Nov. 26, 2000)

The examiner has advanced the following grounds of rejection on appeal:

claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Eriguchi in view of Su (answer, pages 3-4);

claims 2 through 6 and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eriguchi and Su as applied to claim 1, further in view of Xu (answer, pages 4-5);

claims 7 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eriguchi, Su and Xu further in view of Ko (answer, page 5); and

claim 25 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Jahns in view of Su and further in view of Xu (answer, pages 5-6).

Appellants state that the appealed claims “stand or fall together” (brief, page 3). Thus, we decide this appeal based on appealed claims 1, 2, 7 and 25 as representative of the grounds of rejection. 37 CFR § 1.192(c)(7) (2003); *see also* 37 CFR § 41.37(c)(1)(vii) (effective September 13, 2004; 69 Fed. Reg. 49960 (August 12, 2004); 1286 Off. Gaz. Pat. Office 21 (September 7, 2004)).

We affirm the grounds of rejection of appealed claims 1 through 9 and reverse the ground of rejection of appealed claim 25. Thus, the examiner’s rejection is affirmed-in-part.

Rather than reiterate the respective positions advanced by the examiner and appellants, we refer to the answer and to the brief and reply brief for a complete exposition thereof.

Opinion

We have carefully reviewed the record on this appeal and based thereon find ourselves in agreement with the supported positions advanced by the examiner (answer, pages 3-5) that, *prima facie*, the claimed systems for monitoring and regulating an etch process encompassed by appealed claim 1, 2 and 7 would have been obvious over the combined teachings of Eriguchi and Su, the combined teachings of Eriguchi, Su and Xu, and the combined teachings of Eriguchi, Su, Xu and Ko, respectively, to one of ordinary skill in this art at the time the claimed invention was made. Thus, we again consider the record as a whole with respect to these grounds of rejection in light of appellants’ rebuttal arguments in the brief and reply brief. *See generally, In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

Appellants’ arguments with respect to claims 1, 2 and 7 involve the clause “a system for directing a single beam of light onto one or more gratings located on at least one portion of the wafer” in claim 1. We must first interpret this language by giving the terms their broadest reasonable interpretation in light of the written description in appellants’ specification, including the drawings, as it would be interpreted by one of ordinary skill in this art, in the light of arguments advanced by the examiner and appellants, without reading into this claim any limitation or particular embodiment disclosed in the specification. *See In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22,

13 USPQ2d 1320, 1322 (Fed. Cir. 1989); *In re Priest*, 582 F.2d 33, 37, 199 USPQ 11, 15 (CCPA 1978).

In order to determine the interpretation of the subject clause of claim 1, we first consider the language “a system for directing *a single beam of light*” and “one or more *gratings* located on at least one portion of the wafer” in the third clause in the context of the claim as a whole including the subsequent clause “an etch monitoring system operable to measure one or more etching parameters from *light reflected from one or more gratings*” (emphasis supplied). We note the following disclosure in the written description of the specification with respect to these claim terms:

The present invention provides a system that facilitates controlling etching processes involved in semiconductor manufacturing. An exemplary system can employ one or more light sources arranged to *project light* onto one or more features and/or *gratings* on a wafer, and one or more light sensing devices . . . for *detecting light reflected* and/or refracted by the one or more features and/or *gratings*. A *grating is usually divided into a large number of sufficiently thin planar grating slabs to approximate an arbitrary profile*. The light reflected from the one or more features and/or gratings is indicative of at least one parameter of etching processes [Page 3, ll. 12-20; emphasis supplied.]

Fig. 7 illustrates a perspective view of a chuck 730 supporting the wafer 710 whereupon one or more gratings may be formed. The wafer 710 may be divided into a grid pattern as shown in Fig. 8. Each grid block (XY) if the grid pattern corresponds to a particular portion of the wafer 710, and each grid block associated with one or more *gratings* and/or one or more portions of one or more *gratings*. The grid blocks are individually monitored for etch process parameters and etching may be individually controlled for each grid block. *It is to be appreciated that the size and/or shape of gratings can be manipulated to facilitate analyzing different critical dimensions*. For example, for a particular later in an integrated circuit, a CD relating to a width between features may be important. Thus, *the gratings can be patterned to optimize analyzing the width between the features*. [Page 17, ll. 4-14; emphasis supplied.]

Appellants submit that “[t]he term grating is defined to mean ‘a system of close equidistant parallel lines or bars, especially lines ruled on a polished surface, used for *producing spectra by diffraction*.’ (See Webster’s Revised Unabridged Dictionary, © 1996, 1998 MICRA,

Inc.[Web site omitted.]” (reply brief, page 4.).¹

We have difficulty subscribing to the ordinary, dictionary definition of “grating” as that term is used in the context of the language of claim 1, in two respects. First, the dictionary definition involves a standardized system of lines or bars for the express purpose of “producing spectra by diffraction” while the claim language of claim 1 in context specifies measuring light “reflected” from at least one grating, without specifying any pattern for that or other gratings. And second, it is apparent from the written description in the specification that the term “grating” is intended to mean *any* pattern that can be used to measure any feature of interest on the wafer by reflecting a beam of light. Thus, it is clear from the claim language as a whole and the written description in the specification that the term “grating” is intended by appellants to have a different meaning from the ordinary, dictionary meaning of the term, and therefore, we interpret “grating” to mean any pattern that can be used to measure any feature of a wafer using light reflected therefrom. *See generally, Texas Digital Systems, Inc. v. Telegenx Inc.*, 308 F.3d 1193, 1208, 64 USPQ2d 1812, 1819 (Fed. Cir 2002) (citing *In re Paulsen*, 30 F.3d 1475, 1479, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994); *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1387-88, 21 USPQ2d 1383, 1386 (Fed. Cir. 1992)).

The other language of the subject clause that is of interest is “a system for directing a single beam of light onto” at least one “grating.” We determine that in the context of the language of claim 1 as a whole, the claim requires only that “the light reflected from” at least one “grating” measured by any manner of “etch monitoring system” is the result of said “single beam of light.” The examiner finds that a system which uses a second beam of light for another purpose than reflection from a grating for measurement purposes can be encompassed by claim 1 because of the open-ended, transitional term “comprising” (answer, page 7), and appellants argue that the examiner’s position gives “no patentable weight to the term single in the subject claim”

¹ This definition of “grating” comports with that found in *Webster’s Third New International Dictionary* 992 (Phillip Babcock Gove, ed., Springfield, Massachusetts, Merriam-Webster Inc. 1993). In other dictionaries, “grating” is similarly defined in context as “2. *Physics*. Diffraction grating.” *Webster’s II New Riverside University Dictionary* 573 (Boston, The Riverside Publishing Company. 1988); *The American Heritage Dictionary, Second College Edition* 545 (Boston, Houghton Mifflin Company, 1982).

(reply brief, paragraph bridging pages 3-4; emphasis in original deleted). We agree with the examiner because we determine that all that is required by claim 1 is any system that directs at least a single beam of light onto at least one grating, which light is reflected from the grating and measured, regardless of any other activity of that system, and particularly in view of the transitional term “comprising.” *See generally, Vehicular Technologies Corp. v. Titan Wheel Int’l Inc.*, 212 F.3d 1377, 1383, 54 USPQ2d 1841, 1845 (Fed. Cir. 2000); *Genentech Inc. v. Chiron Corp.*, 112 F.3d 4954, 501, 42 USPQ2d 1608, 1613 (Fed. Cir. 1997); *In re Baxter*, 656 F.2d 679, 686 210 USPQ 795, 802 (CCPA 1981).

Comparing the claimed system for monitoring and regulating an etch process encompassed by claim 1, as we have interpreted this claim above, with Eriguchi, we find the following with respect to reference **FIGs. 18** and **3** relied on by the examiner. Eriguchi would have disclosed to one of ordinary skill in this art that in **FIG. 18**, the wafer **103** has “[a] pattern . . . for optical evaluation” in n-type semiconductor region **101** which receives a beam of probe light **618** from lamp **611**, wherein “a detector **613** . . . [receives] reflected probe light **619** from the n-type semiconductor region **101** provided in the top surface of the wafer **103**” for purposes of measuring an optical property (col. 37, ll. 35-67). The wafer **103** with a *slanted line* pattern for optical evaluation pattern **101** is illustrated in **FIG. 3**, from which it is clear that region **101** is “a region for monitoring **Rmn** to be subjected to optical evaluation” (col. 28, ll. 8-13).

We determine that the *slanted lines* shown in region **Rmn(101)** of wafer **103** in **FIG. 3** would have been considered by one of ordinary skill in this art to be indeed a “grating,” as that term is used in appealed claim 1, for purposes of reflecting a single beam of light which is detected for measuring purposes as illustrated by **FIG. 18**.²

Thus, we find that the system for monitoring and regulating an etch process described by Eriguchi is encompassed by appealed claim 1. We are not convinced otherwise by appellants’ arguments (brief, pages 4-5; reply brief, pages 2-4). The region **Rmn(101)** falls within the

² It is well settled that a reference stands for all of the specific teachings thereof as well as the inferences one of ordinary skill in this art would have reasonably been expected to draw therefrom, *see In re Fritch*, 972 F.2d 1260, 1264-65, 23 USPQ2d 1780, 1782-83 (Fed. Cir. 1992); *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968), presuming skill on the part of this person. *In re Sovish*, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985).

definition of the term “grating” that we determined above. Furthermore, exciting light **620** generated by laser **612** as shown in **FIG. 18** does not constitute a second beam of light from the same light source that is *detected* and thus does not distinguish over claim 1. Indeed, it is apparent from **FIG. 18** and the accompanying text in Eriguchi which we cited above, that light **620** is *not* reflected from the region **Rmn(101)** to a detector, unlike probe light **618** from lamp **611** which is reflected from **Rmn(101)** of wafer **103** and detected by detector **613**.

We find that appellants rely on the same arguments with respect to appealed claims 2 and 7 (brief, page 6; reply brief, page 5). Since Eriguchi would have disclosed to one of ordinary skill in this art the claim limitations that appellants contend are not found in Xu and Ko, we need not discuss the latter references.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Eriguchi and Su, the combined teachings of Eriguchi, Su and Xu, and the combined teachings of Eriguchi, Su, Xu and Ko, with appellants’ countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1 through 9 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

Turning now to appealed claim 25, we find that each of the four clauses in this claim specifies “means for” a specified function but does not define structure which satisfies that function and thus, the strictures of 35 U. S. C. § 112, sixth paragraph, apply. *See Texas Digital Systems, Inc. v. Telegenx, Inc.*, 308 F.3d 1193, 1208, 64 USPQ2d 1812, 1822-23 (Fed. Cir 2002), and cases cited therein. Therefore, the “means” language in each clause must be construed as limited to the “corresponding structure” disclosed in the written description in the specification and “equivalents” thereof. *In re Donaldson Co.*, 16 F.3d 1189, 1192-95, 29 USPQ2d 1845, 1848-50 (fed. Cir. 1994) (*in banc*). The “corresponding structure” is that “structure in the written description necessary to perform that function [citation omitted],” that is, “the specification . . . clearly links or associates that structure to the function recited in the claims.” [Citation omitted.]” *Texas Digital Systems, supra*. “[A] section 112, paragraph 6 ‘equivalent[]’ . . . [must] (1) perform the identical function and (2) be otherwise insubstantially different with respect to structure. [Citations omitted.]” *Kemco Sales, Inc. v. Control Papers Co.*, 208 F.3d 1352, 1364,

54 USPQ2d 1308, 1315-16 (Fed. Cir. 2000). “[T]wo structures may be ‘equivalent’ for purposes of section 112, paragraph 6 if they perform the identical function in substantially the same way, with substantially the same result. [Citations omitted.]” *Kemco Sales*, 208 F.3d at 1364, 54 USPQ2d 1315. “[T]he ‘broadest reasonable interpretation’ that an examiner may give means-plus-function language is that statutorily mandated in [35 U.S.C. § 112,] paragraph six,” and in this respect, the examiner should not confuse “impermissibly imputing limitations from the specification into a claim with properly referring to the specification to determine the meaning of a particular word or phrase in a claim. [Citations omitted.]” *Donaldson*, 16 F.3d at 1195, 29 USPQ2d at 1850; *see also Morris*, 127 F.3d 1048, 105556, 44 USPQ2d 1023, 1028 (explaining *Donaldson*).

If the examiner does not interpret the “means for” claim language in applying the prior art, such omission will result in a finding that the examiner has not established a *prima facie* case of obviousness because all of the claim limitations have not been considered. *See, e.g., In re Geerdes*, 491 F.2d 1260, 1262-63, 180 USPQ 789, 791-92 (CCPA 1974) (In considering grounds of rejection under 35 U.S.C. § 103, “every limitation in the claim must be given effect rather than considering one in isolation from the others.”); *cf. Donaldson*, 16 F.3d at 1195-97, 29 USPQ2d at 1850-52.

In the present appeal, we do not find in the answer (pages 5-6 and 8-9) the requisite analysis required to determine the “corresponding structure” disclosed in the written description in appellants’ specification and thus the “equivalents” thereof, in order to interpret claim 25 as required under § 112, sixth paragraph, and apply the prior art thereto under § 103 (a). In the absence of such analysis, we reverse the rejection of appealed claim 25 under § 103 (a).

In summary, we have affirmed the grounds of rejection involving appealed claims 1 through 9, and we have reversed the ground of rejection of appealed claim 25.

The examiner’s decision is affirmed-in-part.

Remand

We remand the application to the examiner for consideration of issues, including a new ground of rejection, raised by the record. 37 CFR §1.41.50(a)(1) (effective September 13, 2004; 69 Fed. Reg. 49960 (August 12, 2004); 1286 Off. Gaz. Pat. Office 21 (September 7, 2004));

Manual of Patent Examining Procedure (MPEP) § 1211 (8th ed., Rev. 2, May 2004; 1200-29 – 1200-30).

Appealed claim 25 should be rejected under the provisions of 35 U.S.C. § 103(a) as being unpatentable over the combined teaching of Jahns, Su and Xu and/or any other reference or combination of references applicable to the claimed invention encompassed by this claim as determined by the interpretation of the means-plus-function clauses therein by the examiner in accordance with the authority that we have cited above.

Accordingly, the examiner is required to take appropriate action consistent with current examining practice and procedure to enter the above new ground of rejection on the record for purposes of completing prosecution of appealed claim 25, supplying and applying any other applicable prior art in this ground as the examiner deems appropriate.

In view of the above remand to the examiner for further prosecution of this application, this decision is not final for purposes of judicial review. 37 CFR §1.41.50(e) (effective September 13, 2004; 69 Fed. Reg. 49960 (August 12, 2004); 1286 Off. Gaz. Pat. Office 21 (September 7, 2004)).


We hereby remand this application to the examiner, via the Office of a Director of the Technology Center, for appropriate action in view of the above comments.

This application, by virtue of its “special” status, requires immediate action. *See* MPEP § 708.01(D) (8th ed., Rev. 2, May 2004; 700-127). It is important that the Board of Patent Appeals and Interferences be informed promptly of any action affecting the appeal in this case. *See, e.g.,* MPEP § 1211 (8th ed., Rev. 2, May 2004; 1200-30).

AFFIRMED-IN-PART

REMANDED


BRADLEY R. GARRIS
Administrative Patent Judge


CHARLES F. WARREN
Administrative Patent Judge

BOARD OF PATENT APPEALS AND INTERFERENCES

Beverly A. Pawlikowski
BEVERLY A. PAWLIKOWSKI
Administrative Patent Judge

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Himanshu S. Amin
Amin & Turocy, LLP
National City Center
1900 E. 9th Street, 24th Floor
Cleveland, OH 44114